Workshop Session #4:

Learning and Human Effectiveness in Embedded Virtual Simulations

Summary of Discussion

This session was facilitated by Ms. Claudy Koerhuis (NED). Student modeling, coaching strategies and tutor perception and their relationship to EVS were discussed. Four papers were presented as noted below:

- *Making a case for machine perception of trainee affect to aid learning and performance in embedded virtual simulations* - Robert Sottilare, Ph.D. (USA), U.S. Army Research Development & Engineering Command – Simulation & Training Technology Center

- *Intelligent tutoring methods for optimizing learning outcomes with embedded training* - Randy Jensen (USA), Stottler-Henke; Jeffery Mosley, Ph.D. (USA), Optimetrics, Inc.; COL Michael Sanders (USA), DoD Modeling & Simulation Coordination Office; and MAJ Jason Sims (USA), U.S. Army Command and General Staff College

- *Spoken dialogue: extending embedded virtual simulation with a very human dimension* - Benjamin Bell, Ph.D. (USA), Chi Systems, Inc.; and Philip Short (UK), Aerosystems International Ltd.

- *Intelligent agent-supported autonomous training in virtual simulation environments* - Annerieke Heuvelink, Ph.D. (NED), TNO Defense Security and Safety; Karel van den Bosch, Ph.D. (NED), TNO Defense Security and Safety; Willem A. van Doesburg (NED), TNO Defense Security and Safety ; and Maaike Harbers (NED), TNO Defense Security and Safety

Workshop Exercise #4: *Mindmapping learning in EVS*

For this session, the mindmapping exercise focused on technology (tools and methods) to enhance learning in EVS. The questions below were intended to focus and energize the discussion:

- What are the factors enabling/limiting learning in EVS?
- When is the optimal time to provide feedback in EVS? On error, on trainee request, other?
- How much human involvement is required to support learning in EVS and how much can be delegated to intelligent agents?
- How is feedback provided to trainees during embedded training?

The mindmaps shown below are the group products from Exercise #4 on learning in EVS.

Report Documentation Page

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See also ADA562526. RTO-MP-HFM-169 Human Dimensions in Embedded Virtual Simulation (Les dimensions humaines dans la simulation virtuelle integree)., The original document contains color images.

14. ABSTRACT

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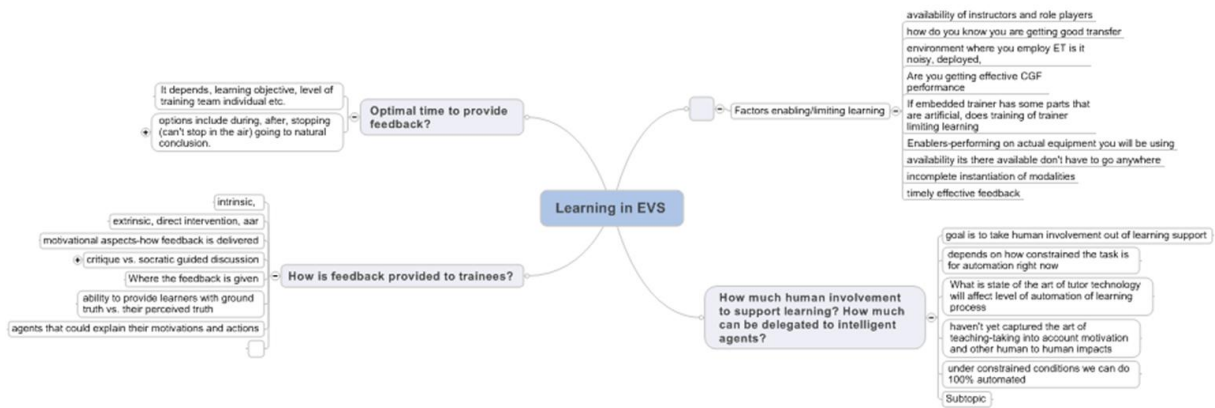Prescribed by ANSI Std Z39-18

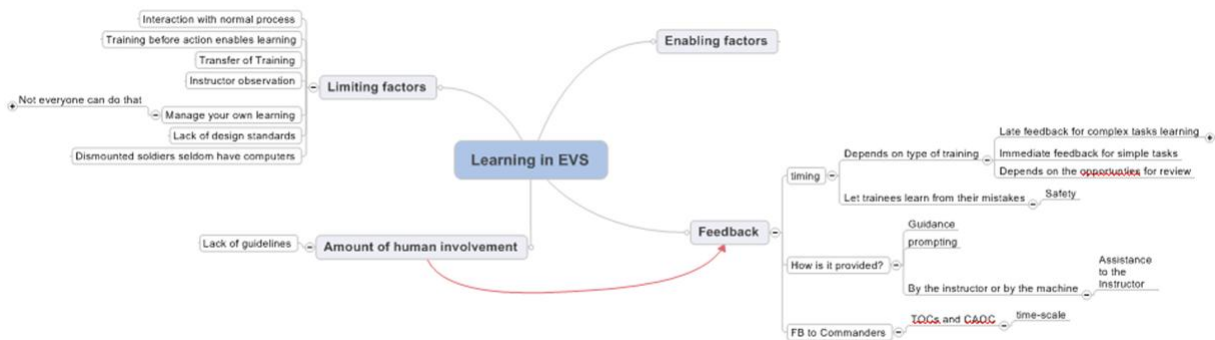*Figure 1: Group 1 Mindmap for Exercise #4*

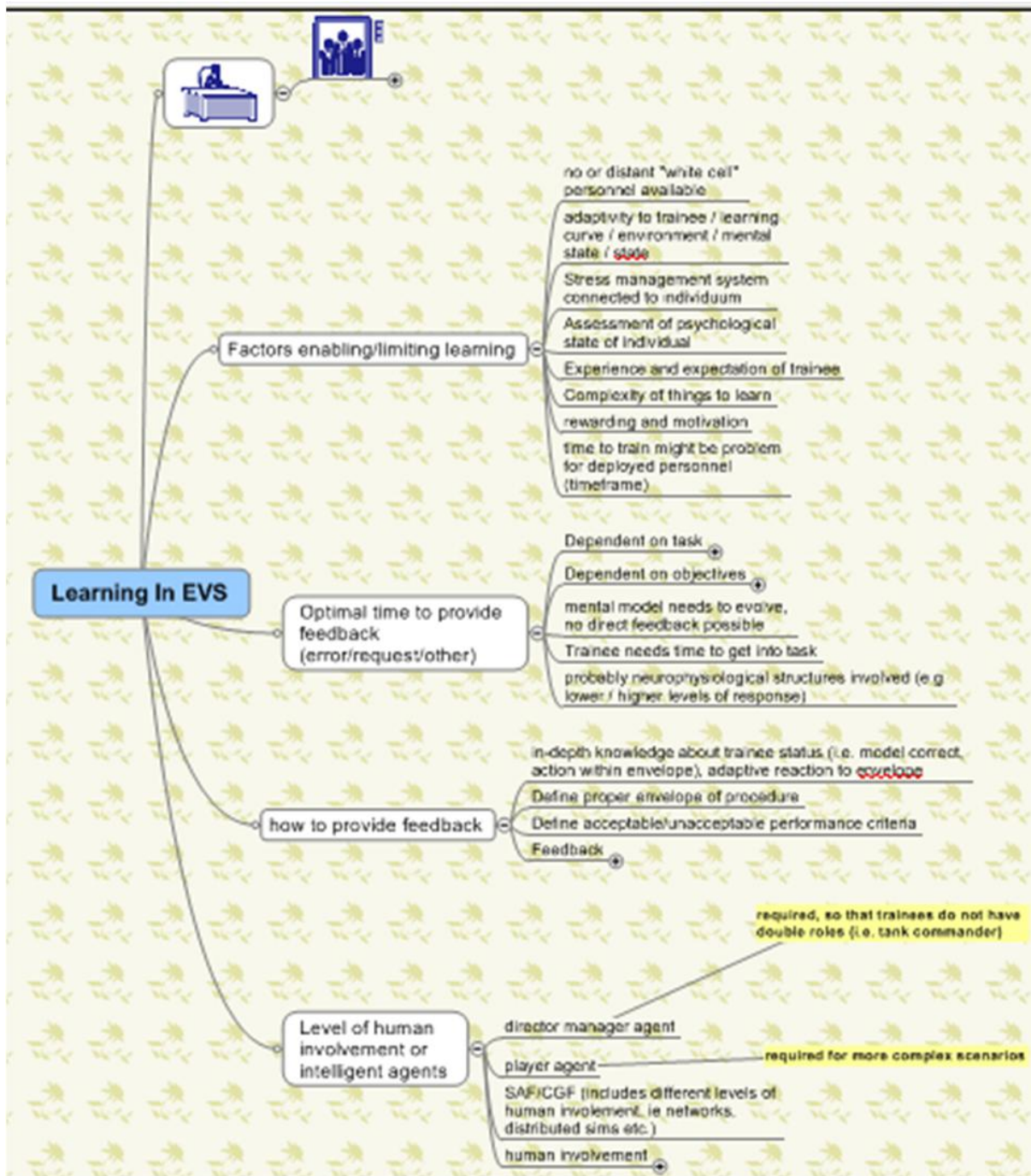*Figure 2: Group 2 Mindmap for Exercise #4*

Figure 3: Group 3 Mindmap for Exercise #4

The three mindmaps above resulted in four common themes: feedback methods, feedback frequency, automation and learning enablers/limitations. Each is discussed below:

Feedback Methods: The groups identified different methods to provide feedback (e.g. via human instructor or via intelligent agents) and concluded that this feedback can be both intrinsic and extrinsic.
The groups identified two important points related to feedback delivery:

- Feedback should be presented when trainee's actual performance varies sufficiently from expected performance
- Feedback should be adapted (modified) based on knowledge of trainee's performance

Feedback Frequency: The groups identified three important points related to feedback frequency:
- Feedback frequency should be task dependent
- Feedback should be triggered by mistakes
- Feedback should be triggered by trainee requests

Automation: The groups thought more automation was needed in training and reinforced the following points:
- Automation should be provided in situations where human tutors are either unavailable or that it is not practical/cost effective.
- Automation should be provided for training support functions to help reduce costs.
- Intelligent agents require additional development in the areas of tutors, scenario directors, coaches, player agents (team members) and process management agents

Learning Enablers and Limitations: The following learning enablers/limitations were identified:
- Increased availability of training through EVS as training goes with the Warfighter (enabler).
- Limited availability of instructors/support personnel for EVS (limitation)
- Limited capabilities of current intelligent agents (e.g. tutors) including adaptiveness and ability to motivate trainees
- The need for more natural interfaces/interaction with virtual simulations (limitation)
- Incomplete understanding of trainee state based on methods (limitation)

Each of the limitations noted above are also opportunities for future research.